UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/593,960	09/22/2006	Yasushi Araki	Q97019	4025

65565 7590 10/28/2009

SUGHRUE-265550
2100 PENNSYLVANIA AVE. NW
WASHINGTON, DC 20037-3213

EXAMINER	
GUPTA, RAJ R	
ART UNIT	PAPER NUMBER
2814	

MAIL DATE	DELIVERY MODE
10/28/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/593,960	ARAKI, YASUSHI	
	Examiner	Art Unit	
	RAJ GUPTA	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 July 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) *2,3 and 5* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,4 and 6-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 September 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Attorney's Docket Number: Q97019

Filing Date: 3/18/2005

371 Date: 9/22/2006

Claimed Domestic Priority: NONE

Claimed Foreign Priority: 3/22/2004 (JP 2004-082002)

Applicant: Araki

Examiner: Raj R. Gupta

DETAILED ACTION

This Office Action responds to the amendment filed on 7/10/2009.

Acknowledgement

1. The amendment filed on 7/10/2009, responding to the Office Action mailed on 4/10/2009, has been entered. The present Office Action is made with all the suggested amendments being fully considered. Accordingly, pending in this Office Action are **claims 1, 4, and 6-20**.

Claim Objections

2. **Claims 14 and 16** are objected to because of the following informalities: these claims depend from claim 3, which has now been canceled. For the purposes of examination under prior art in the instant Office Action, these claims will be treated as if they depended from claim 1. Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

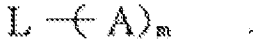
> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. **Claims 1, 4, and 6-17** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Petritsch et al (US 6340789)** in view of **Stossel et al (US 7223484)** as evidenced by **Asfandiarov et al (Investigation of Electron Structure of 2,1,3-Benzothiadiazole Derivatives by Means of Negative Ion Mass Spectrometry, Photoelectron Spectroscopy and Absorption Spectroscopy; Rapid Commun. Mass Spectrom. 12, 595–602, 1998)**, **Nakaya et al (US 5792557)**, and **Kimura (US 2003/0072965)**.

5. With regard to **claim 1**, Petritsch teaches, in Fig 5, a photodetector (Fig 5 item 20) comprising: at least one electron transporting organic material (Fig 5 item 14; "MCP" col 6 ln 31); and at least one hole transporting material (Fig 5 item 6).

6. Petritsch does not explicitly teach that said at least one electron transporting organic material has an ionization potential of 5.8 eV or more, wherein said ionization potential of said at least one electron transporting organic material is larger than an energy necessary for the highest-level electron of said at least one hole transporting organic material to be taken out to a vacuum infinite far point, wherein said ionization potential of said at least one electron transporting organic material is larger than an ionization potential of said at least one hole transporting organic material by 0.6 eV or more, and wherein said at least one electron transporting organic material is a compound represented by formula (I):

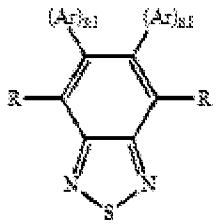
Formula (I)



wherein m represents an integer of 2 or more; L represents a linking group; and each of A's independently represents a hetero ring group where at least two aromatic hetero rings are condensed to each other, and A's are the same or different.

7. Stossel teaches the use of 2,1,3-Benzothiadiazole derivatives as Formula (III):

Formula (III)



as, “An organic photodetector … transport material …” (col 30 ln 11-13), in since, " The 2,1,3-benzothiadiazole-containing compounds of the invention lead, when appropriate devices are used, to excellent operating lives …” (col 2 ln 57-59).

8. However Stossel does not explicitly disclose the fact that the ionization potential of 2,1,3-Benzothiadiazole derivatives is greater than 5.8 eV.

9. Asfandiarov provides evidence that the ionization energies of 2,1,3-benzothiadiazole derivatives are in excess of 5.8 eV, as they range from 7.77 - 8.44 eV (pg 597, Table 2).

10. Thus Stossel does teach: the ionization potential of said at least one electron transporting organic material is more than 5.8 eV.

11. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use the electron transporting organic material of Stossel as evidenced by Asfandiarov in concert with the photodetector of Petritsch to lead to appropriate devices with excellent operating lives.

12. Petritsch/Stossel do not explicitly teach that said ionization potential of said at least one electron transporting organic material is larger than an energy necessary for the highest-level electron of said at least one hole transporting organic material to be taken out to a vacuum infinite far point, wherein said ionization potential of said at least one electron transporting organic material is larger than an ionization potential of said at least one hole transporting organic material by 0.6 eV or more, and wherein said at least one electron transporting organic material is a compound represented by formula (I):

Formula (I)

wherein m represents an integer of 2 or more; L represents a linking group; and each of A's independently represents a hetero ring group where at least two aromatic hetero rings are condensed to each other, and A's are the same or different.

13. Nakaya teaches that said ionization potential of said at least one electron transporting organic material is larger than an energy necessary for the highest-level electron of said at least one hole transporting material to be taken out to a vacuum infinite far point or an ionization potential of said at least one electron transporting organic material is more than an ionization potential of said at least one hole transporting organic material, by stating, "… the difference in ionization potential Ip between the layer having a hole injecting and transporting function and the layer having a[n] … electron injecting and transporting function is at least 0.25 eV," (col 10 ln 47-52), in order to have a, "photo-electron function," (col 4 ln 41). Please note that it is well known in the art that the energy necessary for the highest-level electron of a given material to be taken out to a vacuum infinite far point is the very definition of an ionization potential.

14. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use the ionization potentials of Nakaya along with the photodetector of Petritsch/Stossel to have a device with a photo-electron function.

15. Petritsch/Stossel/Nakaya discloses most aspects of the instant invention (see paragraphs 5-14 above). However, Petritsch/Stossel/Nakaya fails to show that said ionization potential of said at least one electron transporting organic material is larger than an ionization potential of said at least one hole transporting organic material by 0.6 eV or more. Nonetheless, the skilled artisan would know too that the difference in ionization potential between the hole and electron transporting materials would impact charge separation effectiveness.

16. The specific claimed difference in ionization potential, absent any criticality, is only considered to be the "optimum" difference in ionization potential disclosed by Petritsch/Stossel/Nakaya that a person having ordinary skill in the art would have been able to determine using routine experimentation based, among other things, on the desired charge separation, manufacturing costs, etc., (see Goesch, 205 USPQ 215 (CCPA (19080)), and since neither non-obvious nor unexpected results, i.e. results which are different in kind and not in degree from the results of the prior art, will be obtained as long as the difference in ionization potentials is used, as already suggested by Petritsch/Stossel/Nakaya.

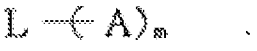
17. Since the applicant has not established the criticality (see next paragraph) of the difference in ionization potentials stated and since these differences in ionization potentials are in common use in similar devices in the art, it would have been obvious to one of ordinary skill in the art at the time of the invention to use these values in the device of Petritsch/Stossel/Nakaya.

CRITICALITY

18. Please note that the specification contains no disclosure of either the critical nature of the claimed difference in ionization potentials or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

19. Petritsch/Stossel/Nakaya do not explicitly teach that said at least one electron transporting organic material is a compound represented by formula (I):

Formula (I)



wherein m represents an integer of 2 or more; L represents a linking group; and each of A's independently represents a hetero ring group where at least two aromatic hetero rings are condensed to each other, and A's are the same or different.

20. Kimura teaches that said at least one electron transporting organic material is a compound represented by formula (I):

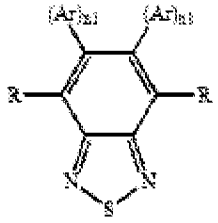
Formula (I)

21. wherein m represents an integer of 2 or more; L represents a linking group; and each of A's independently represents a hetero ring group where at least two aromatic hetero rings are condensed to each other, and A's are the same or different ([0015]) to, “provide a … device excellent in … durability …” ([0007]).

22. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use the electron transporting organic material of Kimura along with the photodetector of Petritsch/Stossel/Nakaya to provide a device excellent in durability.

23. With regard to **claim 4**, Stossel teaches the use of 2,1,3-Benzothiadiazole derivatives as Formula (III):

Formula (III)



as, "An organic photodetector … transport material …" (col 30 ln 11-13).

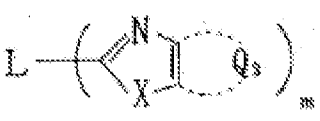
24. However Stossel does not explicitly disclose the fact that the ionization potential of 2,1,3-Benzothiadiazole derivatives is 6.0 eV or more.

25. Asfandiarov provides evidence that the ionization energies of 2,1,3-benzothiadiazole derivatives are in excess of 6.0 eV, as they range from 7.77 - 8.44 eV (pg 597, Table 2).

26. Thus Stossel does teach that the ionization potential of said at least one electron transporting organic material is 6.0 eV or more.

27. With regard to **claims 6-10**, Kimura teaches that said at least one electron transporting organic material is a compound represented by formula (III):

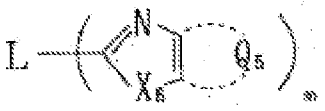
Formula (III)



wherein m represents an integer of 2 or more; L represents a linking group; each of X's independently represents O, S, Se, Te or N-R; R represents a hydrogen atom, an aliphatic hydrocarbon group, an aryl group or a hetero ring group; and each of Q3's independently represents an atomic group necessary for forming an aromatic hetero ring;

and said at least one electron transporting organic material is a compound represented by formula (V):

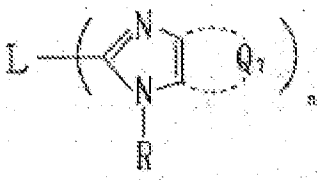
Formula (V)



wherein m represents an integer of 2 or more; L represents a linking group; each of Xs's independently represents O, S or N-R; R represents a hydrogen atom, an aliphatic hydrocarbon group, an aryl group or a hetero ring group; and each of Q5's independently represents an atomic group necessary for forming a 6- membered nitrogen-containing aromatic hetero ring;

and said at least one electron transporting organic material is a compound represented by formula (VII):

Formula (VII)

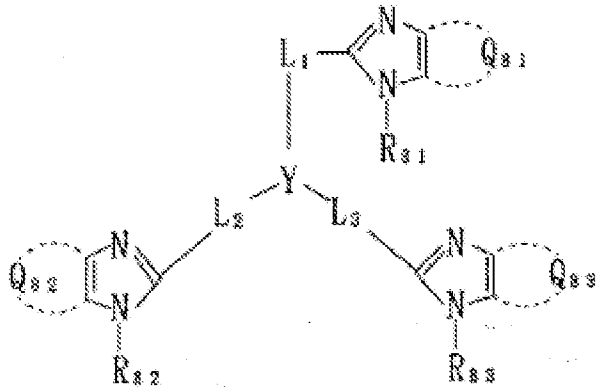


wherein n represents an integer of 2 to 8; L represents a linking group; each of R's independently represents a hydrogen atom, an aliphatic hydrocarbon group, an aryl group or a hetero ring

group; and each of Qv's independently represents an atomic group necessary for forming a 6-membered nitrogen-containing aromatic hetero ring;

and said at least one electron transporting organic material is a compound represented by formula (VIII):

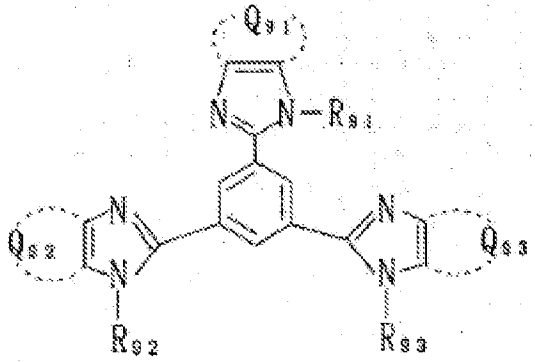
Formula (VIII)



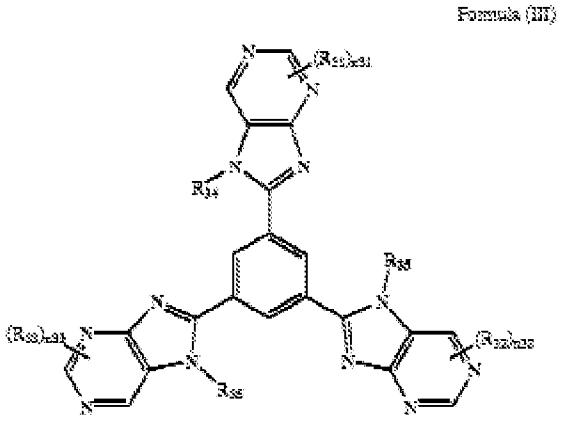
wherein Q81, Q82 and Q83 each independently represents an atomic group necessary for forming a 6-membered nitrogen-containing aromatic hetero ring; R81, R82 and R83 each independently represents a hydrogen atom, an aliphatic hydrocarbon group, an aryl group or a hetero ring group; L1, L2 and L3 each independently represents a linking group; and Y represents a nitrogen atom or a 1,3,5-benzenetriyl group;

and said at least one electron transporting organic material is a compound represented by formula (IX):

Formula (IX)



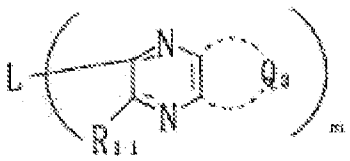
wherein Q91, Q92 and Q93 each independently represents an atomic group necessary for forming a 6-membered nitrogen-containing aromatic hetero ring; and R91, R92 and R93 each independently represents a hydrogen atom, an aliphatic hydrocarbon group, an aryl group or a hetero ring group, by teaching in Formula (III):



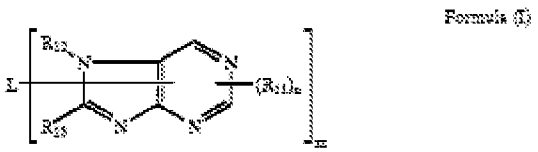
where, "R31, R32 and R33 represent a substituent, respectively; R34, R35 and R36 represent a hydrogen atom, an aliphatic hydrocarbon group, an aryl group or a heterocyclic group, respectively; and n31, n32 and n33 represent an integer of 0 to 2, respectively," ([0015]).

28. With regard to **claim 11**, Kimura teaches that said at least one electron transporting organic material is a compound represented by formula (XI):

Formula (XI)



wherein m represents an integer of 2 or more; L represents a linking group; each of Q3' s independently represents an atomic group necessary for forming an aromatic hetero ring group; and each of R1l's independently represents a hydrogen atom or a substituent, by teaching Formula (I):



where, "R11 represents a substituent; R12 represents a hydrogen atom, an aliphatic hydrocarbon group, an aryl group or a heterocyclic group; R13 represents a hydrogen atom or a substituent; n represents an integer of 0 to 2; L represents a single bond or a linking group; and m represents an integer of 2 or more," ([0010]).

29. With regard to **claim 12**, Petritsch teaches in Fig 5: at least one transparent electrode (Fig 5 item 4, "are transparent" col 5 ln 32); and at least one electrode (Fig 5 item 12), wherein said at least one electron transporting organic material (Fig 5 item 14) is interposed between said at least one transparent electrode and said at least one electrode (it is clear from Fig 5 that item 14 is disposed between items 4 and 12).

30. With regard to **claim 13**, Petritsch teaches in Fig 5: at least one transparent electrode (Fig 5 item 4, "are transparent" col 5 ln 32); and at least one electrode (Fig 5 item 12), wherein said at

least one electron transporting organic material (Fig 5 item 14) and said at least one hole transporting material (Fig 5 item 6) are interposed between said at least one transparent electrode and said at least one electrode (it is clear from Fig 5 that items 14 and 6 are disposed between items 4 and 12).

31. With regard to **claim 14**, Petritsch teaches in Fig 5: at least one transparent electrode (Fig 5 item 4, "are transparent" col 5 ln 32); and at least one electrode (Fig 5 item 12), wherein said at least one electron transporting organic material (Fig 5 item 14) and said at least one hole transporting organic material (Fig 5 item 6) are interposed between said at least one transparent electrode and said at least one electrode (it is clear from Fig 5 that items 14 and 6 are disposed between items 4 and 12).

32. With regard to **claim 15**, no limitations of patentable weight are present in this claim beyond those of claim 1. This is a product by process claim and thus, "Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). Please see MPEP 2113 for further discussion.

33. With regard to **claim 16**, no limitations of patentable weight are present in this claim beyond those of claim 3. This is a product by process claim and thus, "Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production.

If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). Please see MPEP 2113 for further discussion.

34. With regard to **claim 17**, Petritsch teaches: An imaging device comprising a photodetector. by stating, "there is provided a method of forming a … photoconductive device …" (col 2 ln 24-26).

35. **Claims 18-20** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Petritsch et al (US 6340789)** in view of **Stossel et al (US 7223484)** as evidenced by **Asfandiarov et al (Investigation of Electron Structure of 2,1,3-Benzothiadiazole Derivatives by Means of Negative Ion Mass Spectrometry, Photoelectron Spectroscopy and Absorption Spectroscopy; Rapid Commun. Mass Spectrom. 12, 595–602, 1998)**, **Nakaya et al (US 5792557)**, and **Kimura (US 2003/0072965)** as applied to claim 17 above, and further in view of **Iwasaki (US 2003/0209651)**.

36. Petritsch/Stossel/Nakaya/Kimura teach most of the limitations of these claims as discussed above in paragraphs 5-22 and 34.

37. Petritsch also teaches in Fig 5: a substrate (Fig 5 item 10); and a first layer comprising a first photodetector (Fig 5 items 6, 28, and 14).

38. Petritsch/Stossel/Nakaya/Kimura do not explicitly teach: a second layer comprising a second photodetector; a third layer comprising a third photodetector; the first photodetector comprises a blue light photodetector; the second photodetector comprises a green light photodetector; and the third photodetector comprises a red light photodetector.

39. Iwasaki teaches a second layer comprising a second photodetector (Fig 1 item 101); a third layer comprising a third photodetector (Fig1 item 103); the first photodetector (Fig 1 item 102) comprises a blue light photodetector (clearly visible in Fig 1 as the portion of the light labeled "B" is absorbed by this layer); the second photodetector comprises a green light photodetector (clearly visible in Fig 1 as the portion of the light labeled "G" is absorbed by this layer); and the third photodetector comprises a red light photodetector (clearly visible in Fig 1 as the portion of the light labeled "R" is absorbed by that layer), in order to not have to use a color filter system ([0005]-[0007]).

40. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use the multiple photodetectors of Iwasaki along with the photodetector of Petritsch/Stossel/Nakaya/Kimura to not have to use a color filter system.

Response to Arguments

41. Applicant's arguments filed 7/10/2009 have been fully considered but they are not persuasive.

42. The applicants argue:

> The present invention yields unexpectedly superior results with respect to the difference in ionization potential of "0.6 eV or more." These unexpectedly superior results can be seen from the results shown in Table 3 of the present application. As seen from the comparison between the quantum efficiency results of Compound D (ionization potential of 6.3 eV, resulting in a difference in ionization potential of 0.5 eV over Compound E) and Compound 21 (ionization potential of 7.5 eV, resulting in a difference in ionization potential 1.7 eV over Compound E), the quantum efficiency of the embodiment using Compound 21 (i.e., 42%) is much superior to that of Compound D (i.e., 31%).

43. The examiner responds:

44. An increase of quantum efficiency of 35% (from 31% to 42%) is not an unexpected result when the corresponding increase in the difference in ionization potential increases by 240% (from 0.5 eV to 1.7 eV). Particularly when compared to the difference between Compound 119

and Compound D where an increase in the difference in ionization potential of 67% (0.3 eV to 0.5 eV) resulted in an increase of quantum efficiency of 19% (from 26% to 31%). Hence the rejection of claim 1, corresponding to the rejections of now canceled claims 2 and 3 in the previous Office Action, is maintained and further explicated in paragraphs 13-18.

Conclusion

45. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

46. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

47. Any inquiry concerning this communication or earlier communications from the examiner should be directed to RAJ GUPTA whose telephone number is (571)270-5707. The examiner can normally be reached on Monday-Thursday 9am-6pm.

48. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on (571)272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

49. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

RAJ GUPTA
Examiner, Art Unit 2814
October 23, 2009

/Marcos D. Pizarro/
Primary Examiner, Art Unit 2814